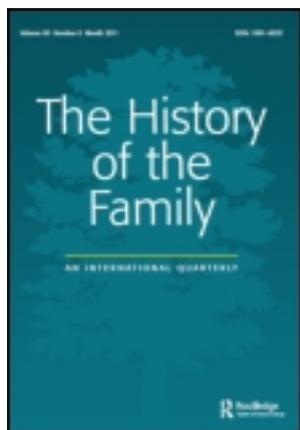


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'The true social molecule'. Industrialization, paternalism and the family. Half a century in Le Creusot (1836-86)

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‘The true social molecule’. Industrialization, paternalism and the family. Half a century in Le Creusot (1836–86)

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There is little doubt that both urbanization and industrialization changed the way people live and interact. However, even though family structure has long been considered as the best indicator of the changes induced, little is known, empirically, about its evolution. We take advantage of a large dataset of matched censuses in a fast industrializing city to investigate how families function in a new environment. We show that family formation confronted two structural forces: the sheer numbers of migrants and the company that dominated the labor market. The company tried to promote a new family model by allowing only some kinds of migrants, selected through housing and labor, to settle in the city. Many aspects of their lives were thus constrained by the firm’s paternalistic organization. This process did not occur without resistance but it contributed to the integration of migrants in the city of Le Creusot.

Keywords: family; paternalism; family formation; family structure; France; industrialization; 19th century; household

This is the observation method we need to consider. But where to apply it? To which part of the society, to which element of each country? – To the family, the true social molecule. It is the domestic home that influences, through a more or less direct, but unerring, process, all exterior phenomena. By getting inside it, as if in an observation post, we are certain to capture all these symptoms of sickness or happiness, of antagonism or peace, which must be used as indicators for research. Family is not an artificial or transient entity. While everything else changes, family stays the same. Family transforms daily things into an infinite chain that links together successive generations. By extending, perpetuating, the individual, it is, as Taine so beautifully said, “the only cure for death”.

Emile Cheysson, Director of the Schneider company in Le Creusot, in (Cheysson, 1905)

1. Introduction: industrialization and the family

Discussions about the effects of industrialization on family structure and formation tend to contrast two opposing views: the destruction of a traditional family model – whose very existence and nature are in fact themselves debated – versus the importation into the city of the specific functioning of the nuclear family (on this debate see, among others, Hareven, 1978; Laslett & Wall, 1972; Ruggles, 2003; Ruggles, 2009). This article emphasizes a different view. What matters is not whether a given family model (or another one) has – or has not – been preserved by industrialization, but to understand how family formation occurred in a new industrial environment (Anderson, 1971; Janssens, 1993;

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Szolytzek, Gruber, Zuber-Goldstein, & Scholz, 2011). We aim to observe in concrete terms how households were formed and dissolved in a new urban environment: that of a rapidly industrializing and growing city.

Indeed, as we shall see, the industrializing city of Le Creusot represented a kind of 'pure' experiment of a fast-growing city based on a single industry. The city enjoyed strong economic development linked to steel and to the one firm that controlled everything in the city, Schneider. As it grew, the company developed a strong paternalistic model designed to control every aspect of its workers' lives, including their family lives.

Our goal is to analyze the formation and transformations of families in Le Creusot in a dynamic perspective. From 1820 to 1870 urban population growth was mainly fuelled by new immigrants who came to work in the steel factory. And as time went by, more and more families settled there. The year 1870 marked a brutal change in the life of the city, with a series of strikes and a large uprising (*la Commune*) that was put down by the army. The present study focuses on the whole period, from 1836 to 1886, to give a full picture of the evolution of the city.

Two key issues for understanding family formation are paternalism and migration. Paternalistic policies were implemented and developed by the company owners and managers, the Schneider brothers, but also by the factory head, Emile Cheysson. They concerned almost all aspects of life in Le Creusot. But most of all, and this is what makes them so important here, they controlled housing provision, promoting the development of one-family houses in a workers' housing development. Through housing, a particular family structure was promoted: access to housing was a key instrument in selecting workers and regulating family formation. We shall see to what extent this project may have been successful.

Migration is also key to understanding the evolution of the city, as the vast majority of its inhabitants were migrants. They may have promoted networks and mutual aid in the city – for instance for access to the job market (Grieco, 1988) or for housing – based on their place of origin. Marital endogamy may also result from this type of behavior. But there were also some non network-related migrants (Oris, 2004). And as such, they may have been more isolated and more tied to the employers' policies and demands. They may also have been, as we shall see, much less prone to settle in the city.

We start by presenting the context and the data; we then turn to an analysis of the dynamics of migration and then describe the work–family nexus in the city of Le Creusot before detailing family formation dynamics over the life cycle, starting with marriage and ending with old-age co-residence patterns.

2. Context: a booming industrial town

Le Creusot is located in Burgundy in a region where significant iron and coal mining activities have existed since the sixteenth century at least. An important change occurred in 1768, when an engineer, François Jar, a correspondent of the Academy of Sciences, convinced François de la Chaise, a landowner at Montcenis, a village a few miles from Le Creusot, of the interest of La Charbonnière. De la Chaise obtained a 50-year concession and created the first industrial coking plant in France, based on techniques imported from England. In the late eighteenth century, for the first time in France, iron was cast in a forge fuelled by coal instead of wood. The subsequent foundry – equipped with four blast furnaces – produced cannons for the French army. It was later merged with the glassware factory (*cristerie de la Reine*) that had been constructed there in 1785. But the

successive company owners failed to strengthen its financial position in a context of crisis in the steel sector (Devilleurs & Huet, 1981; Roy, 1962).

In 1836, Adolphe and Eugène Schneider bought the company – which became *Schneider Frères & Cie* – with the help of the Seillière family of bankers and traders, and of the railroad tycoon Louis Boigues (himself the son of a Parisian iron merchant). These entrepreneurs understood that the development both of the railroad and of new construction methods would raise demand for metal products. At that time, the company operated coal mines in the nearby areas, and one boiler works, one foundry, and four smaller forges (Simonin, 1866).

The Schneider Company grew rapidly on the strength of major technological developments: in 1838 the first entirely French-made locomotive – *la Gironde* – was built; in 1841 the world's first steam hammer was completed in Le Creusot, designed by the Schneider engineer François Bourdon. The company was able to increase its production and satisfy strong demand from the railroad, public works (bridges), and shipbuilding industries. In order to control its supply of raw materials (coal and iron), the company purchased several mines in the nearby *départements* (Saône-et-Loire, Nièvre, and Isère).

The Schneider brothers were leading philanthropists and held a strong paternalistic doctrine. They were also important political and financial personalities of nineteenth-century France. Eugène Schneider was a member of Parliament for many years and even presided it in 1867. He was also mayor of Le Creusot. As a result, the organization of the city and of the factory were closely interlinked. However, the paternalistic approach did not prevent regular social unrest, e.g. in 1848 and 1869 (Frey, 1986). The factory grew almost continuously through the mid-nineteenth century. At the end of the Second Empire (around 1870), Schneider had become an industrial giant with almost 9000 manual workers and 400 clerical staff (Dewerpe, 1995, p. 181).

The population of Le Creusot evolved in response to the pace of industrialization and its vicissitudes (Figure 1). Before 1830, it was a small village with fewer than 1500 inhabitants. As industrialization took hold, the village rapidly became a city that grew at an

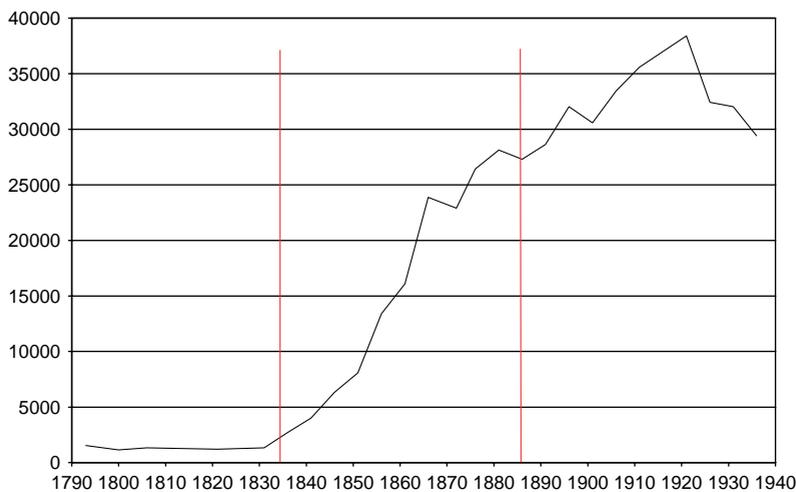


Figure 1. Population of Le Creusot between the French Revolution and WWII. Source: censuses (every five years). The two vertical lines delimit the time period for which we have full census records.

impressive rate of between 5% and 10% per year. Indeed, between 1836 and 1866, the population increased nine-fold, from 2700 to 23,000. As can be expected, this exceptional urban growth was fuelled by huge migration flows to the city: as early as 1846, most inhabitants of Le Creusot were migrants (Bourdelaïs & Demonet, 1993). As far as one can judge from the 1876 census, migrants came mostly from the surrounding areas: almost 90% of the people living in Le Creusot at that date were born in the surrounding *département* (this figure includes individuals born in Le Creusot itself) with another 4% coming from the seven neighboring ones.¹ Marriage records show that roughly 80% of the men and women who married in the city were born in the *département*, including 10% of men and 30% of women in Le Creusot itself, and 40% and 50%, respectively, within 20 kilometers of the city (Bourdelaïs & Demonet, 1993).

3. Data and linkage

To analyze family structure in this context we take advantage of census data. We use census lists (*listes nominatives du recensement*) drawn up by the mayor in each municipality following completion of the census. These lists contain information about the composition of households and about their members, including their age, occupation and, of course, the relationships between them (Bourdelaïs, 2004). Although each census can only provide a ‘snapshot’ of coresidence patterns, censuses can be linked to explore household dynamics. Censuses were conducted every five years in France between 1831 and 1936 using a stable procedure which yielded a more or less identical set of information each time. We can therefore gain an accurate picture of how the city evolved over time (Bourdelaïs, 1984).

Our dataset is based on ten successive censuses linked together from 1836 onward. The censuses have been completely computerized (including all information available on the *listes nominatives*) from 1836 to 1886, with the exception of the 1841 census that did not report age, and which is therefore difficult to use (Bourdelaïs & Demonet, 1995).

We have linked the census lists as accurately as possible. Individuals were matched from one census to another (the next one or the previous one or a more distant one) using individual characteristics such as family name, first name, and age. Household composition was also helpful for increasing the matching rate, but special identification procedures were used for isolated individuals (living alone in their household) and old persons. Finally we performed sensitivity tests to control the matching results.

Overall, more than 50% of the people recorded in a given census were matched between two censuses. There are two ways to consider these linkages. Each individual observed in a given census is – or is not – linked to the next one. Reciprocally, each individual observed in a given census is – or is not – linked to the previous one.

Apart from matching failures, two factors explain why an individual present in a census does not appear in the next one: mortality and out-migration. Neither of these events is directly observable with our data. We know the total number of deaths in the city for a given census year so we can estimate roughly the number of deaths in the inter-census period, multiplying by the time span and dividing by three to exclude the deaths of young children who were both born and died between the two censuses. Using such an approximation we can see that the linkage rate is pretty high before 1866 (Table 1). This implies (assuming that our matching quality remains constant) that the people who arrived before the 1870–71 crisis were quite sedentary. Almost three-quarters of those who are reported in a given census remained in the city from one census to the next. Of course, at the same time, the city was growing in size which means that these people represent a

Table 1. Number of individuals linked from one census to the next. Le Creusot 1836–86.

Year	N total	Growth rate	Deaths	N excl. Deceased	N linked F	% linked F
1836	2694	8.80	66	2474	1653	66.81
1846	6264	4.95	231	5879	4231	71.97
1851	7976	10.88	335	7417	5640	76.04
1856	13,366	3.62	452	12,612	8882	70.42
1861	15,965	6.93	544	15,058	10,696	71.03
1866	22,314	0.08	576	21,162	11,171	52.79
1872	22,425	3.70	534	21,713	12,593	58.00
1876	25,936	1.43	602	24,932	14,218	57.03
1881	27,843	-2.68	605	26,834	14,288	53.25
1886	24,309					

Sources: authors' computations. 'N total' is the number of inhabitants in Le Creusot for a given year. 'Growth rate' is the mean annual population growth between a census and the next one. 'Deaths' is the number of deaths during the census year. 'N excl. deceased' is an estimate of the population excluding deaths during the intercensal period. 'N linked F' and '% linked F' are, respectively, the number and share of individuals present in Le Creusot in a given census year that were successfully matched to the **next** census (and the percentage is thus equal to 'N linked F'/'N excl. death').

smaller share of the total population. After the crisis, the population seems to be much more volatile: many people left the city (many young workers were fired from the Schneider's firm in retaliation for their part in the social uprising). Therefore, not surprisingly, the proportion of the individuals enumerated in 1866 who are matched in 1872 is much lower than before. But the percentages also remain lower for the following years until the end.

Let us now look at things the other way round. In [Table 2](#), we consider the share of individuals linked from a given census to the previous one. Here two phenomena limit linkages: intercensal births and in-migration. While we can account for births by simply excluding individuals aged less than five years old, we cannot directly observe immigrants.

Overall, this tells the story of Le Creusot from a very different perspective than that of [Table 1](#). As expected, the proportion exactly fits the population growth rate, being low

Table 2. Number of individuals linked from one census to the previous one. Le Creusot 1826–86.

Year	N total	Growth rate	N excl. Children	N linked B	% linked B
1836	2694				
1846	6264	8.80	4706	1617	34.36
1851	7976	4.95	6860	4192	61.11
1856	13,366	10.88	11,950	5576	46.66
1861	15,965	3.62	14,339	8809	61.43
1866	22,314	6.93	19,493	10,583	54.29
1872	22,425	0.08	19,395	10,461	53.94
1876	25,936	3.70	23,940	12,843	53.65
1881	27,843	1.43	25,098	14,082	56.11
1886	24,309	-2.68	21,774	15,212	69.86

Sources: authors' computations. 'N total' is the number of inhabitants in Le Creusot for a given year. 'Growth rate' is the mean annual population growth between a census and the previous one. 'N excl. children' is the population without children whose age is equal to or less than the interval between the two censuses. 'N linked B' and '% linked B' are, respectively, the number and share of individuals present in Le Creusot for a given census year who were successfully matched to the **previous** census (and the percentage is thus equal to 'N linked B'/'N excl. children').

when the population increase is large and high when it is small. The distinction between the pre-crisis and post-crisis periods is much less apparent here, meaning that in-migration remains strong even though out-migration increases.

The figures make us pretty confident about the quality of the matching. First, the proportion linked fits the population growth rate. Second, it is also much higher at the end, once the population has stabilized. Third, the proportion is lower when the interval between censuses is longer (for instance between the first two censuses).

Finally, we have a database of almost 170,000 entries which correspond to 85,000 unique individuals. Of these, half are only recorded once – some of them being young children or old persons who may have died between two censuses, some of them being young adults who probably left the city in that period – a third are observed between two and four times, 7% are observed five or more times, and a very tiny minority is even observed nine or ten times (Table 3).

This table gives some important insights on migration patterns: we observe that close to 60% of individuals appear just once. In other words, 40% of individuals appear at least twice, which means that they stayed at least five years. If we exclude those observed only once, the rate of appearance drops below 20% and attrition is quite regular with each additional observation. Two different groups are highlighted here: on the one hand, very short-term migrants who stay less than five years, maybe without any plans to settle in Le Creusot, on the other, longer-term migrants who stay around 20 years in Le Creusot (controlling, very roughly, for mortality). Moreover, given the growth of the city, most observed individuals arrived at the time of the last censuses. As a result, many are observed only a limited number of times simply because our sample is right-censored after 1886, when the population stabilizes.

Overall this sample provides us with the unique ability to follow the population of an industrializing city over a long span of time. It gives a reliable picture of changes in household composition over time and enables us to study their stability and their transformation in the key period of mass labor migration to the city.

4. Work organization and household structure

The population of Le Creusot was relatively homogeneous. Besides a few rare families who lived in Le Creusot before the development of the Schneider Company, it was primarily composed of young workers, single or married, coming to work in the steel

Table 3. Number of times an individual is observed in the sample.

Number of appearances	N (individuals)	%
1	48,406	56.47
2	15,983	18.65
3	9277	10.82
4	5616	6.55
5	3094	3.61
6	1592	1.86
7	1014	1.18
8	400	0.47
9	255	0.30
10	81	0.09
Total	85,718	100.00

Sources: Authors' computations and (Archives départementales de la Saône-et-Loire, 1836 to 1886).

factory. How did these groups reproduce and settle, or otherwise, in the city? The share of couples with children rose in 1846 before returning to its initial level in 1856, at around 70% of the total number of households (Bourdelaïs & Demonet, 1993, p. 57). At the same time, the composition of the population changed radically as migration, both inward and outward, became the major contributor to the city's growth. Finally, the proportion of individuals aged over 60, as well as that of individuals over 20 years, increased steadily over time as migrants settled, had children, and grew old in the city.

We want to explore the relation between population growth in a context of rapid industrialization and that of family structures. Le Creusot represents a particular kind of urban growth that relies totally on one firm and its unique industrial organization, and occurs very rapidly in what was originally a rural village. In a sense, it is an exemplary situation of urban development due to industrialization. For this reason, workforce organization is an important issue. The company's owners, the Schneider family, wanted to stabilize the workforce not only in the short term but also in the long run. To do so, they had to ensure, quite literally, its reproduction (hence, for instance, the development of private schools linked with the company). In nineteenth-century France, industrial workers were very often mobile as they kept some links with agricultural activities (Bompart, Magnac, & Postel-Vinay, 1990a). For many young workers, getting a factory job provided a rapid means to accumulate initial capital before taking over the family farm or starting some independent business in agriculture, commerce or craft trades (Garrier & Hubscher, 1988; Noiriël, 1986). The harsh working conditions were accepted only on a temporary basis and in return for the higher wages offered (Bompart, Magnac, & Postel-Vinay, 1990b). The Schneider factory was no exception and the annual turnover of workers is estimated at over 10% (Dewerpe, 1995, p. 190).

The same applies to female labor. To what extent were women also involved in paid employment? First, households may have implemented a strategy of rapid wealth accumulation so as to leave Le Creusot as quickly as possible. In that case, having both spouses working would make sense. Second, for whatever reason (crisis, work accident), certain households may have relied on the wife's wage as the unique source of income. But it should nonetheless be noted that the steel industry is a predominantly male industry and job opportunities for women may have been limited in Le Creusot, even if they had been willing to work.

For the managers and owners, this flexibility was both an asset and a source of worry. Indeed it entailed poor reliability, absenteeism and, most importantly, the difficulty of hiring – and keeping – skilled workers. As an answer, they developed various policies aimed at maintaining the labor force – or at least the best part of it – on the job: housing privileges (Devillers & Huet, 1981; Frey, 1986), some types of social assistance, schooling for children (Bergeron, 2001), specialized schools (Bourdelaïs, 1989), job guarantees for older workers (Melchers, 1988) and so on. All these measures may have contributed, directly or indirectly, to keeping families in the city. The schools developed by the company for its workers' children, for instance, may have encouraged them to stay in Le Creusot. Of course, the question remains of whether such an ideal social model actually worked in practice (to what extent? for what kind of workers? etc.) and how it evolved over time.

We want to observe the effects of these policies on family structures in Le Creusot. It should be noted that the Schneiders themselves certainly had a very clear idea of what a family should be. Indeed, they imagined Le Creusot as an advanced realization of the Leplaysian model of society. The influence of Frédéric Le Play can be seen directly through the position of Emile Cheysson who was both one of Le Play's most famous students and disciples and a former Director of the Schneider factory.

The family was considered as the central feature of a well-functioning society in two different ways. Firstly, the family – more precisely the extended family under the authority of the father who was necessarily the breadwinner, the home owner, and the family head – was considered as the elementary component of society (Emile Cheysson (1905) considers the family to be ‘the true social molecule’). Secondly, the business owner sees himself as the father of his workers and views his company as a large family of people sharing the same common interest. As stated by André Dolfuss, another famous businessman sharing this same paternalistic view, ‘the employer [*le patron*] owes more than his wage to his workers’. The Schneiders (or, for that matter, Cheysson) were strongly opposed to any form of state intervention. For them, it was the responsibility of the employer and father to implement various forms of social investment to take care of education, child protection, access to housing, health insurance, pensions, etc., always with reference to the family (and also to religion). Historians have labeled this form of control as ‘paternalism’ (see for instance Debouzy, 1988; or Gueslin, 1992). In the end, paternalism would lead to harmony and, in the words of Le Play quoted by Gueslin (1992, p. 207), to ‘a state of the world that occurs when managers enjoy the respect and the dedication of their workers, and when workers know that they can rely on their employer’s loving care that will help them to guard against their own vices and lack of foresight’.

So company policies were designed to promote these ideas right down to the organization of the family itself. And housing was undoubtedly one channel through which this was achieved. It is true that, initially, faced with the huge influx of young workers, the company housed its employees in large residential buildings similar to barracks (indeed, they are called *casernes*) (Devillers & Huet, 1981, p. 45–55). But as early as 1848, they start promoting family houses (the social unrest of 1848 is clearly one factor of this development). Inspired directly by Leplaysian ideas, the Schneiders considered the family as a factor of stability and social harmony, and to promote the family they developed independent family houses. This was part of an urban development project entirely controlled by the Schneiders. Through both the factory, the ownership of the land and their control of the municipal council, they were able to literally design the shape of the city and the structure of its buildings.

Starting in 1860 a department of architecture and urbanism was established within the company to design houses and plan neighborhoods (d’Angio-Barros, 2011), leading to the construction of several workers’ housing developments (*cités ouvrières*) made up of individual (i.e. one-family) houses: les Pompiers in 1860; la Villedieu in 1865; and so on. Those houses were initially owned by the company and rented to workers, but were later made available for purchase. This was seen as a reward for years of hard labor and as a way both to stabilize the labor force and to promote the Schneider model to the outside world.

But both policies – renting and selling – served also, and mainly, as a means to develop hierarchies among workers and as a key instrument of social control. They were used to promote good workers and exclude those who did not fit into the paternalistic model (Frey, 1986). As described by the company itself: ‘[renting a house] is a reward for workers. They are rewarded on the basis of the quality and length of service accomplished, family dependents, and all other information that may go in favor of the worker’ (Schneider, 1914, p. 20). In other words, housing was granted on a selective basis and was without doubt a factor of worker inclusion or exclusion. They also helped to establish hierarchies, with the structure and shape of houses being different for manual workers, clerical workers, and engineers (Frey, 1986). The housing policy was only one component of the paternalistic model but it was an important one which promoted a clear view of the family with the male

bread-winner, the children going to Schneider's schools (and destined to follow in their father's footsteps), and the women keeping the house in proper order.

We cannot directly observe how these policies were implemented, and it is true that, despite all the work that has been done on Le Creusot and Schneider, a study of how their policies worked – or not, for that matter – remains to be done. Here, what we offer is a very precise analysis of population change and of household structure in the city. In particular, we can compare different populations in order to get some insights on family formation for distinct population groups that may have been influenced differently by industrialization and Schneider's policies. We will focus especially on two key variables: occupation and migration status. And we will observe them in relationship with household formation but also marital status. To start, we need to establish how industrialization shaped the city's population.

5. Industrialization and population growth in Le Creusot

Overall, as previously noted, there are two different periods in terms of demographic growth. The division between the two is mainly related to the social tensions and upheavals of the late 1860s. It is probably also linked to the economic downturn that affected steel factories in industrial countries, as the railroad networks had been completed in most large countries. And it is true that the post-1875 period marks the end of the company's rapid expansion, if its sales revenue is any indication (Batsch, 1995). However it should be noted that Schneider was much less affected by this downturn than most other steel and iron firms due to its reconversion as an arms maker. The company soon becomes one Europe's leading arms manufacturers, which helped to sustain its growth at a time of rising international tensions. The first period extends from 1836 to 1866 and is characterized by strong population growth (7% a year on average) with a higher share of males, especially young men. The population was still young (around 24 years old on average). This is related, without any doubt, to a huge inflow of migrants (Bourdelaïs & Demonet, 1993). The demographic structure and evolution in the 1872–86 period is quite different: population growth slowed down, the population started to age (27 years old on average in 1886) and the sex ratio fell back to 105 men per 100 women before finally returning, in 1886, to perfect equality. In other words, it seems that the influx of migrants decreased and the population returned to a new equilibrium with slower demographic growth.

The shift in the sex ratio is driven by the progressive slowdown in the arrival of young predominantly male migrants. But one of the specific features of Le Creusot is the fact that many migrants arrived as couples (Bourdelaïs & Demonet, 1993). This explains why the increase in the sex ratio is rather small, both in time and intensity (Figure 2). It is nevertheless pretty impressive if we look at migrants only (we define migrants in a given census as persons who were not present in the city at the time of the previous census). It is always above 140 men per 100 women and rises to almost two men per woman in 1861, the year of the second largest population increase.

The change in the sex ratio over time strengthens the idea that there were two periods: before and after 1870. In the second period, the sex ratio returned to an almost normal level of around one man per woman. Thus there is a sharp contrast between the sex ratios in the two periods. Our intuition is that this reflects more fundamental changes in the population characteristics. Table 4 sums up some key characteristics of the population in Le Creusot, by period. The table makes clear that the population changes considerably between the two periods, in qualitative terms. In the first period the population corresponds to the initial

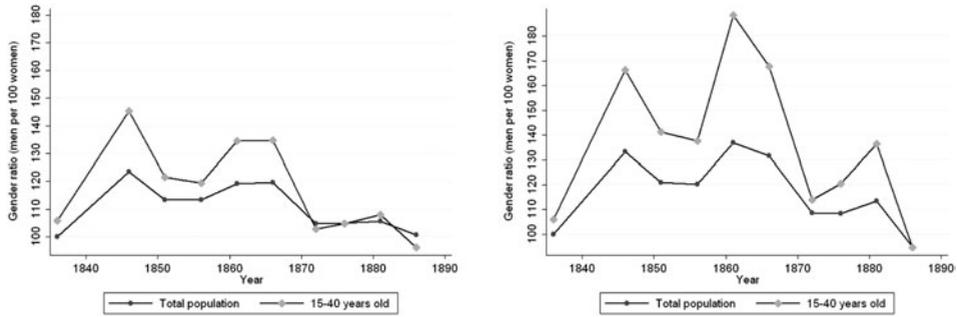


Figure 2. Sex ratio, Le Creusot 1836–86, migrants and total population. Sources: censuses. The figure on the left represents the whole population while the one on the right represents migrants only.

demographic surge, with an overrepresentation of young males. Almost half of the population is aged between 15 and 40 years old; the age structure is more concentrated; and more than half of the inhabitants are recent migrants who arrived in the city within the previous five years. In the absence of any direct indicators of education, the Whipple index gives us some indication of numeracy (if no age rounding occurs it must be equal to 100, the further it is from this figure, the lower the level of numeracy).² This index confirms that there is a change in the composition of the population after 1870. It seems that the educational level of the population in the first period is very low, and that there is a huge improvement in the second period.

Another way to look at the qualitative changes in the population structure is to study changes in the occupational structure. First, we define as workers those who declare an occupation, although this measure is certainly biased as those who are not head of household seem less likely to have an occupation.³ We also classified the occupations roughly according to their skill level, between two extremes, unskilled workers and clerical workers. We also singled out some specific occupations that are the most representative of the steel industry: miners, blacksmiths (qualified steel workers), and ‘*manoeuvres*’ who are the most typical unskilled workers.

As can be seen in Table 5, a general shift occurs that confirms the qualitative improvement in the labor force. The share of unskilled workers declines while the share of

Table 4. Evolution of population in Le Creusot.

	1836	1846–66	1872–86
N (average per census year)	2694	13,177	25,128
Mean population growth rate (per year)		7.3	0.4
Sex ratio	100.0	117.9	104.1
Sex ratio among 15–40 year-olds	106.0	131.0	103.3
Mean age	23.8	24.6	26.7
Age 10th percentile	3.0	4.0	4.0
Age median	20.0	23.0	24.0
Age 90th percentile	50.0	48.0	54.0
Share of 65 +	3.4	2.2	3.7
Share of 15–40 year-olds	41.0	46.4	40.2
Share of migrants		53.3	47.7
Share of migrants among 15–40 year-olds		54.2	46.6
Whipple index	141.5	134.6	113.0

Table 5. Male occupational structure in Le Creusot.

		1836	1846–66	1872–86
Males aged above 10	N	954	27,470	39,406
	Share in the labor force	66.66	78.02	72.25
	Share of unskilled workers	47.48	40.33	38.76
	Share of clerical workers	2.20	1.64	3.59
	Share of miners	13.84	10.14	5.41
	Share of blacksmiths	2.99	7.32	7.90
	Share of 'manoeuvres'	6.13	21.10	18.66
	Share of shopkeepers	4.72	5.68	7.11
Males aged 15–40	N	568	17,317	20,508
	Share in the labor force	74.47	86.07	78.24
	Share of unskilled workers	43.50	38.48	35.54
	Share of clerical workers	1.89	1.64	4.09
	Share of miners	15.60	10.16	4.48
	Share of blacksmiths	3.31	8.26	9.20
	Share of 'manoeuvres'	4.02	20.00	17.07
	Share of shopkeepers	5.20	4.76	6.48

qualified or independent occupations increases. This is particularly clear when comparing miners – a very low-skilled occupation – whose share in the labor force is almost divided by three; blacksmiths whose numbers increase substantially to represent almost one in ten adult males by the end of our period; and clerical workers – the most skilled category – whose share rises from 1.6% in the period of strong population increase to 3.6% in the last period (respectively 1.6 and 4.1% for adult males).

6. Family structure

How did these changes in the composition of the population impact family structures? There are many ways to characterize family structure: household size, number of generations living together, average age at marriage, age gap between spouses, degree of endogamy in marriage, etc. Our objective here is to identify some characteristics of families that may be linked to the peculiar situation of Le Creusot. These characteristics were probably adopted gradually over time, although they do not necessarily correspond to those promoted by the paternalistic model. They may also depend on the material living conditions – number of houses available, for instance. In that way, Schneider's paternalistic policy that we mentioned earlier probably played an important role in organizing family structure. By both renting and selling houses to workers, the company was able to select in a very direct way who was allowed to settle in the city. And that selection was based largely on the workers' family situation.

A first issue is to characterize the family structure and, specifically, to define how this structure can be linked to the industrial process we observe here. One key change in the city's population is the increase in the share of young males, even though it is rather limited compared to what is observed in more typical boom town (Bourdelaïs, 2000). An important feature of family formation is how these young males settle when they first arrive in the city. Among these men, we can distinguish four groups: those who live alone or live among non-kin (most share a dwelling with other young men in a collective household that belongs to the company); those living with a partner with no children; those living in couples with children; and finally those who are not yet settled in an independent household and live with at least one of their parents.

As [Table 6](#) shows, the share of men living alone or in collective households is very high in the initial period, representing more than a quarter of all men aged 20–45 and almost half of all migrants. This means that most men are not in a position to form a new household when they arrive in the city. It may be for material reasons, as there is too little housing, but may also reflect the fact that, as single men, they are not entitled to Schneider-related housing and are thus deprived of the cheapest and easiest way to form their own household. This may be true at the beginning of the period especially, when the city's population was literally exploding. But it seems to remain true for quite a long time. It may also be that young workers arriving in the city had to delay the formation of a new household either because they could not afford it or because they wanted to save money for a subsequent return to their place of origin.

More importantly, as [Figure 3](#) shows, the family structure changed in two opposite ways as adult men increasingly lived with non-kin, either alone or as lodgers, and less and less frequently lived with at least one of their parents. Both results are direct consequences of the change in the demographic structure of the population. But two points must be emphasized. Firstly, there is a clear discrepancy between the two periods, 1846–66 and 1872–86. While the first period is characterized by an influx of migrants living alone or in collective households, the second is more oriented towards family groups arriving in the city. Secondly, the structure observed in 1836, at the very beginning of our period (before the massive arrival of young men) appears again at the very end, in 1886, once the city's population has stabilized. In a way, it looks as if the family structure that prevailed before the boom became again the norm once the most extreme phase had ended. This may be due partly to the paternalistic policy implemented by the Schneider Company, although it is difficult for us to test this hypothesis directly.

Changes in family functioning are also observable in couple formation and evolution. What was the share of households that included a couple? At what age did marital life begin? At what age did couples have children? Who headed the household? What is important here, though, is how migrating from the countryside to the city impacts family formation. It may have two effects: it can postpone couple formation and marriage because it takes more time to find a place to live, as we have just seen with household formation; but also because marriage is less common in an urban environment and the social pressure to marry is weaker than in the countryside. However, the case of Le Creusot is exceptional, with a relatively high proportion of the migrants who arrived in the city being already married. It is generally assumed that, compared to the observed age of marriage in the countryside, marriage occurs less often and later in the city (Oris, 2000; Segalen & Fine,

Table 6. Distribution of men according to their position within their household.

	1836	First period		Second period	
	All men	All men	Migrants	All men	Migrants
N	514	16,081	3121	19,528	1437
Alone	3.70	23.39	36.43	10.67	18.49
Couple without children	9.53	11.39	12.63	9.05	10.80
Couple with children	55.64	48.88	38.34	49.37	40.19
Son living with his parents	22.18	10.40	6.30	16.42	11.77
Other cases	8.95	5.94	6.29	14.48	18.73

Sources: authors' computation. The sample is all men aged 20–45. Migrants mean people who were not matched to the previous census. 'Alone' include those living alone and those living with non-kin (as lodgers or in collective households).

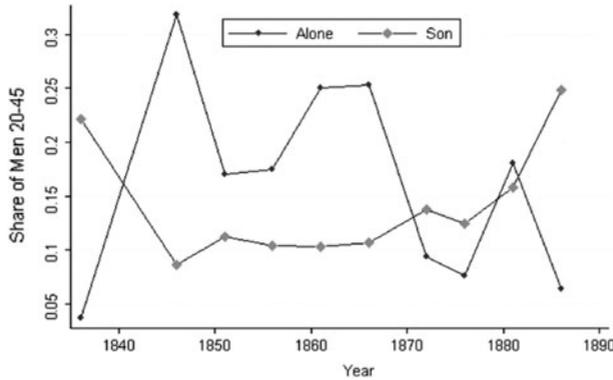


Figure 3. Young males aged 20–45, by position in the household.

1988, p. 427). Again, this is less true of Le Creusot where the age of marriage, calculated from marital records, was relatively low – around 27 years for men and 24 years for women (Bourdelaïs, 2000)–and almost equal to that for the countryside. Moreover the structure of the married population changed very little (Figure 4), at least for men, even though both the intensity of nuptiality and the structure of the population, especially the share of young men, varied with time (Bourdelaïs & Demonet, 1993). What is even more striking with marriage patterns is the very low level of permanent celibacy in Le Creusot: the proportion never married at age 50 was extremely low, always under 5%, while in France as a whole, at that time, it was always above 10% (Table 7). And the rate is the same, and perhaps even lower, for women than for men.

Overall the marriage pattern in Le Creusot is characterized by relatively early (by the standards of the time) and almost universal marriage. Two things are relatively specific to the conditions in Le Creusot: the huge influx of migrants, with women arriving in the city being more often married than men; the small difference in marital behavior between recent migrants and more settled people.

First, women were more often married when they arrived in the city than men. Most women who arrived in Le Creusot were already married. The same pattern applies to all years: recent migrants often married younger than those of the same age who were already there five years before (Figure 5). The difference is limited but we can still see that the

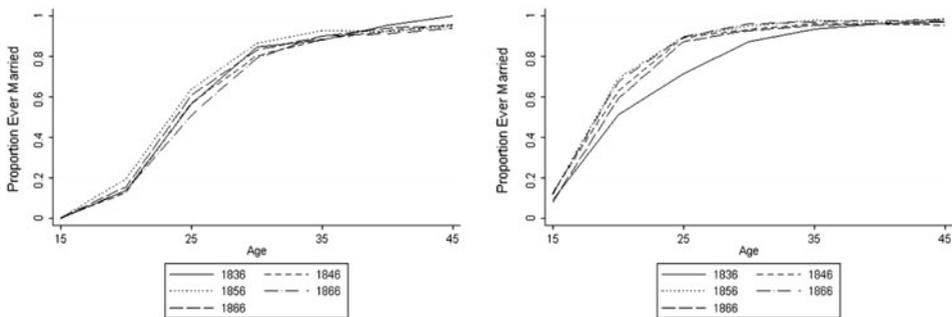


Figure 4. Proportion ever married by age, year and sex (men on the left figure; women on the right figure).

Table 7. Share of permanent celibacy (share of never-married aged 50–54).

Year	Men		Women	
	<i>N</i>	<i>Share</i>	<i>N</i>	<i>Share</i>
1836	38	0.00	33	3.03
1846	90	5.56	101	2.97
1851	146	0.68	129	7.75
1856	178	2.24	179	3.35
1861	296	5.07	245	0.81
1866	437	5.95	389	2.57
1872	507	3.55	445	3.37
1876	556	3.96	477	3.78

pattern is the exact opposite for men. At age 25, for instance, less than 50% of recent migrants (settled less than five years previously) were married, versus almost 70% of those who had been there for more than five years. And this gap never completely closes (even if there are fewer migrants at older ages, the total number is not negligible). But the curves for men and women are almost parallel, the only disturbance being the convergence of sedentary men with women after age 30. In other words, it seems that the factor of adjustment is the age gap between spouses (which is constant over the period, around four years). This creates a lag at the expense of recent male migrants. In a way, the supply of migrant women was insufficient to compensate for the arrival of young single men and the discrepancy we observe mirrors the predominantly male sex ratio. It may also be that there were two different marriage markets, one for recent migrants and another for less recent ones (Oris, 2000).

The key issue here is whether the marriage behavior of migrants differed from that of the sedentary population. This raises two problems. First, a cross-sectional analysis cannot really answer the question. The previous figure merely expresses differences at the time of arrival. Second, as already mentioned, there were very few settled residents in Le Creusot; most people living there were migrants.

To solve the first problem, we need to consider the full life cycle of individuals living in Le Creusot (although we cannot consider them once they have left the city). We can do

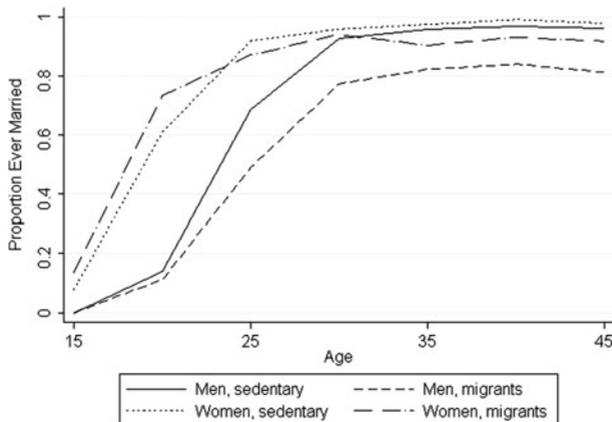


Figure 5. Share of ever married by age, sex and migration status, 1861.

this for a small number of cohorts, let's say for people born between 1830 and 1840⁴. To solve the second one, we can compare those who arrived in the city at marriageable age and those who arrived as children. We do so for the 1831 cohort (individuals born between 1831 and 1836). We compare two groups, those who were born in Le Creusot or arrived there before the age of 15 (we cannot distinguish between these two elements within that group); and those who arrived at later ages (and before 1876 in fact, i.e. before age 45 at most).

Clearly, [Figure 6](#) confirms the previous results: there is no difference in the behavior of newcomers (migrants who arrived as adults in the city) and those who grew up in the city (whether they were born in the city or they simply arrived there as children of migrants). As seen above, the only difference is for women, who were more often married when they arrived in Le Creusot, which means that they married earlier than those who grew up in the city. It's not that migrating women behaved differently, it's just that they were selected as migrants, being more frequently married than male migrants.

7. Out-migration

There is almost no change in marital behavior for migrants. The rural marital model appears to be maintained or imported into the city, except that it is associated with a very low level of permanent celibacy. How can we reconcile this last fact with, first, the sex imbalance – at least in the first period – and, second, the change in the intensity of nuptiality (which results mainly from that sex imbalance)? Out-migration is the key to explaining this apparent contradiction. In other words, those who leave the city are much more likely to be single. Our intuition is that these people were excluded from the city in many different ways. They were excluded from the labor market first, which had material and financial implications, but they were also probably excluded from the marriage market. The Schneider Company's control of the labor market (but also of the housing market) was so strong that it could almost decide, as an employer, to exclude those it did not want. Therefore those without a job were, almost literally, excluded from the city.

We can try to test this assumption by looking specifically at those who leave the city. Earlier, we defined migrants as those who are recorded in a given census but not in the previous one. In the same way, we can characterize out-migrants as those who are located in a census but not in the next one. Of course this is an underestimation; we cannot be sure that these individuals are not present in the next census but we were not able to locate them. In fact, we cannot deny that some of the characteristics of interest here may interfere

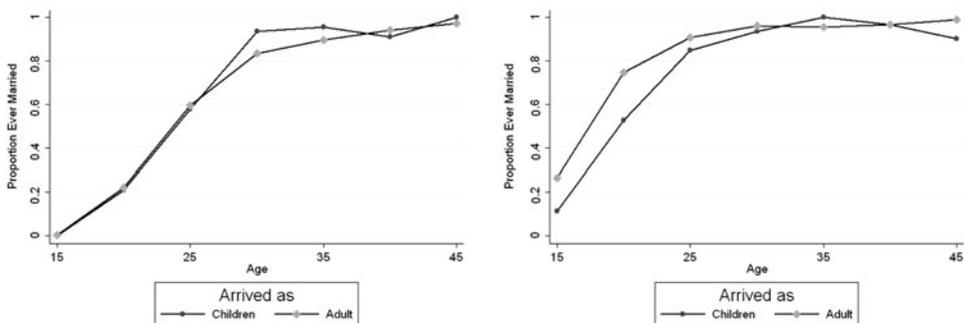


Figure 6. Share of ever married men (figure on the left) and women (figure on the right) in the 1831 cohort by age of arrival in Le Creusot.

Table 8. Out-migrants, Le Creusot 1836–1876.

	All, age 15 +		All 15–45		Male 15–45	
	Stayers	Outmigrants	Stayers	Outmigrants	Stayers	Outmigrants
N	43,315	33,411	34,100	25,924	17,082	15,713
Sex ratio	101.7	138.0	99.2	147.0		
Mean age	35.0	34.4	29.8	27.3	27.4	30.2
Median age	34.0	30.0	30.0	26.0	26.0	30.0
Share of migrants	38.1	60.7	40.6	63.0	43.6	67.3
Share of single	23.3	39.1	28.9	48.8	35.0	57.7

with the matching process. For instance, single individuals living with non-kin are certainly harder to match from one census to the next. However, the effects we observe here are so strong that they are very unlikely to be explained by matching errors alone.

Indeed, as can be seen in [Table 8](#), out-migrants are exactly as expected: predominantly male, young, and single. As noted in the data section, mortality introduces a bias: some individuals we characterize as out-migrants simply died between the two censuses. In that respect our results underestimate the fact that out-migrants were older (and this also explains why the age gap is much smaller for the whole population, as mortality is a less important issue when considering only the 15–45 age group). Furthermore, the sex ratio of out-migrants is at least as high as that of in-migrants. In fact for 15–45 year-olds, it is higher, with more than 60% of out-migrants being men. At the same time, most out-migrants are single and the share is even higher for men, with 58% of 15–45 year-old men being single, compared with only a third of the male stayers. Another striking feature is the large share of migrants (people who arrived after the previous census) in the out-migrants group, a result that mirrors other findings on migration to cities during the industrial era (Hochstadt, 1999, p. 157–162). And it is clear that mortality alone cannot explain such high rates.⁵ This demonstrates that stable employment was hardly the norm in Le Creusot. In fact, two-thirds of the men aged 15–45 who left the city had arrived less than five years earlier. Even when accounting for mortality (low at these ages) and possible matching errors, this is a huge number.

Unfortunately, it is not possible to test empirically whether some individuals are victims of deliberate policy on the part of the employers to exclude them, even though substantial qualitative evidence and numerous testimonies lend support to this argument (Dumay, 1891). But we can at least get some hints by looking at the occupation structure. A first hint is labor market participation. It is not easy to define unemployment, though. The most obvious way is to look at those who declare an occupation. But this may be biased for several reasons. Another standard way to define unemployment is to look at those who declared an occupation at a given census but not for the next one (Costa, 1998; Lee, 1999). We use both measures to access labor market participation and we consider some indicators of occupation for those who participate. We restrict our analysis to men aged 30–55, ages where most men are married or about to become so. We want to test whether both singles and out-migrants occupied worse positions on the labor market.

Clearly, single persons are much more frequently out of the labor force, whether we measure this directly or use unemployment status. The share of unskilled workers is also much higher than for non-single males of that age group. Certainly, we cannot conclude any causal relationship. These individuals may have something else (for instance poor health) that explains both why they are unemployed and single. But, again, given how

strong the effects are, there is little doubt that there is a relationship between being single and being unemployed.

The case concerning outmigration is less straightforward, although in both cases (single or not) the share of unskilled workers and of unemployed is higher for out-migrants than for stayers (and, except in the case of unemployment for singles, the difference is always significant) (Table 9).

Things might work differently for women. Presumably, the presence of unemployed women is more common in households formerly established in Le Creusot. But the steel industry is not a large employer of women. And Schneider relied on a male breadwinner model whereby wives were assumed to stay at home. This was particularly clear when considering the development of schools for women (*écoles ménagères*) that were designed to promote a gendered model of homemaking (Fontaine, 2010). On top of that, even when they were working, women were less likely to declare an occupation. This can be seen on Figure 7. The share of women who declare an occupation forms a U-shape, with around one fifth of women declaring an occupation at either end. During the peak period of migration, however, the share of women declaring an occupation is halved. Decomposition by marital status shows that there is a decline for all three groups after 1836. It is more impressive for widows but the sample is rather limited (121 widows). The decline is smaller for single women, for whom there is even an increase in both the 1850s and 1870s. This can be linked to the arrival of many single women coming to Le Creusot to work. The share of married women declaring an occupation remains low throughout the period, probably because they are working within the household.

So the overall decline is in part a composition effect, with married women (who probably came to Le Creusot with a husband working in the steel industry) representing an increasing share of the total number of women (it rose from 58% in 1836 to 67% in 1846 and peaked in 1870 at over 70% before declining in the 1870s), and a structural effect with most women (singles excepted) being less prone to declaring an occupation.

Let's take a closer look at the occupation declared by women (given that, as we have just shown, most women didn't declare one, which does not mean they were not working). Over time, there seems to be a structural change in these occupations, with day laborers, which initially accounted for three quarters of all occupations, being replaced by seamstresses or laundrywomen. That change may in part be artificial and may simply reflect the use of a more precise vocabulary to qualify the occupation. But there's no

Table 9. Unemployment by occupational groups, Le Creusot 1846–76.

	All		Outmigrants		Stayers	
	Non single	Single	Non single	Single	Non single	Single
N	18,026	2006	6515	1330	11,511	676
On the labor market	97.2	85.3	96.3	87.1	97.7	82.0
Unemployed	2.0	11.6	2.4	14.6	1.9	10.1
N	17,520	1712	6277	1158	11,243	551
Share unskilled workers	38.6	49.4	40.5	51.8	37.6	44.2
Share of clerical	2.1	4.4	2.3	4.4	1.9	4.5
Share of miners	8.7	7.6	7.3	6.5	9.5	9.9
Share of blacksmiths	7.5	5.7	7.2	5.2	7.8	6.7
Share of 'manoeuvre'	18.6	26.4	20.0	27.5	17.8	24.0
Share of shopkeepers	7.3	6.5	7.9	6.1	6.9	7.4

Note: (male, 30–55 years old, 1846–76)

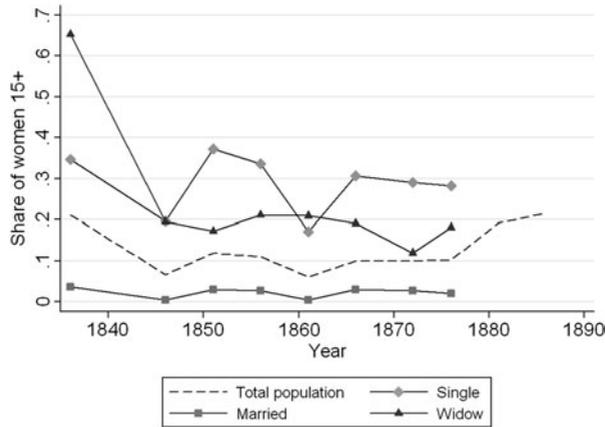


Figure 7. Share of women (over 15 years old) declaring an occupation.

denying a change in the composition of the labor force with the rise of women providing small services (such as laundry and sewing) to this metallurgic city (Table 10).

Unfortunately, we cannot assess the pattern for 1881 and 1886 by marital status. But a reasonable guess would be that another structural change occurs, with widows again forming a large group among women in Le Creusot. In fact, one of the consequences of the population boom is, precisely, the ageing of the city's population. And this is also an issue where family functioning is at stake (Alter, 1996).

8. Aging in an industrial city of migrants

As time went by, migrants from the countryside tended to settle in Le Creusot. The share of the population above 65 declined until the mid-1850s, reaching a kind of plateau. And, again, there is a clear contrast between the two periods before and after 1869. In the second period, not only did the share of old people return rapidly to its pre-industrialization level, but it started rising much faster and soon exceeded that level. It should be mentioned, though, that this level of aging was quite low with respect to that of France as a whole (Bourdieu & Kesztenbaum, 2007) (Figure 8).

This ageing was due to a combination of factors.

First, it does not result from a decreasing share of young people: young adults arriving in the city over time founded families and had children. The number of births grew rapidly from the 1850s. The number of adults increased faster than the number of young people under 20.

Second, it cannot be explained by an inflow of elderly people to the city (for instance to live with settled newcomers). No such phenomenon is observed. Neither do we observe the arrival of young persons or couples in the city to live with older relatives who recently settled there. By and large, migration of elderly people to Le Creusot was very limited.

This means that only individuals living permanently in Le Creusot contributed to this ageing phenomenon. This has several implications. First, some people working at Schneider survived to old ages, despite the harsh working conditions. Second, not all individuals quit town after a life of work to go back to the countryside where they were born. Third, the presence of a growing number of elderly people in town increased the opportunities for familial cohabitation (Ruggles, 2007). Furthermore, Schneider's very

Table 10. Occupations of women in the labor force, Le Creusot 1836–86.

	All, age 15 +			All 15–45		
	1836	1846–1866	1872–1886	1836	1846–1866	1872–1886
N	175	1783	5048	101	1458	3808
Share in the labor force	21.2	9.2	15.5	16.5	9.8	16.7
Share of day laborers (<i>Journalière</i>)	73.1	14.8	13.0	64.4	11.7	9.8
Share of servants	17.1	22.2	16.1	23.8	23.7	18.1
Share of seamstresses	1.7	18.8	25.8	3.0	21.8	31.0
Share of laundrywomen	1.1	9.5	6.7	2.0	10.7	6.2
Share of shopkeepers	4.0	9.6	8.9	2.0	7.7	7.9
Share of clerical workers	0.6	2.1	4.5	1.0	2.2	4.6

pro-family paternalistic policy favored a large family model, especially as Schneider encouraged workers to buy their dwelling.

If we look at the percentage of the individuals aged 65 or more living with their own children, we observe, however, that while this number is large, it decreases from above 60% to 45%, for both men and women (Figure 9).

Thus, even though conditions in Le Creusot increasingly favored the extended family, cohabitation did not develop, quite the contrary. This does not mean that family as an institution declined. It is well known that cohabitation is just one aspect of family cohesion. In a similar context of industrializing Lancaster, Anderson (1971) emphasized the role of the family as an important sustaining force in mutual aid relationships. In his case, as in the case of Le Creusot, it is well documented that kinship served in channeling chain migration, in finding work, in providing support during dependency and old age, etc. Nevertheless, even though Schneider promoted a strong family system, the extended family model did not take hold in Le Creusot.

9. Conclusion: paternalism and family structures

Clearly, both industrialization and urbanization had a significant impact on family structures. First, family formation was often postponed; this is especially true for the first

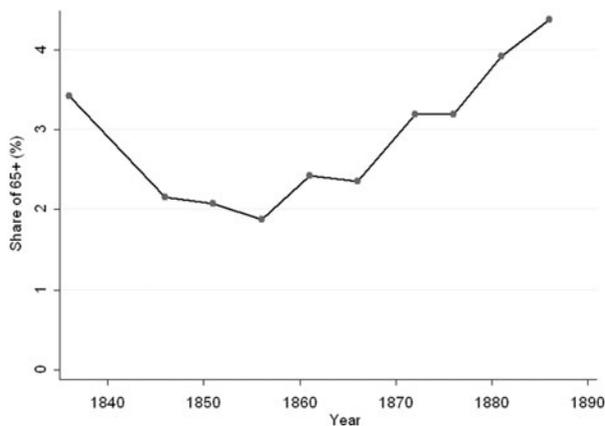


Figure 8. Share of population over 65 years old, Le Creusot 1836–86.

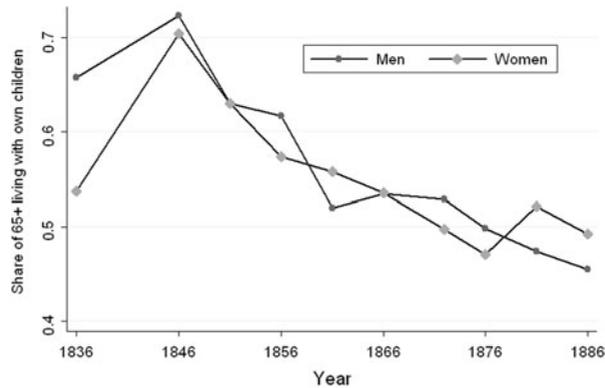


Figure 9. Share of persons aged 65 + and by sex living with at least one child, Le Creusot 1836–86.

generation of migrants. People married at older ages and had children later. Second, there were also structural changes in living arrangements. For instance, intergenerational co-residence declined even though there was probably an increase in the presence of kin, both adult and elderly, living in the same place.

In this paper, we analyze the way a paternalistic endeavor shaped labor migration to form the urban family. The rise of the steel industry in Le Creusot depended on the development of a permanent and stable workforce exclusively devoted to industrial work and with increasing mastery of a large range of industrial skills. This workforce was initially composed mainly of migrants from nearby areas who were attracted to Le Creusot by the promise of high wages. They came primarily for work, not to settle there. To develop a permanent workforce, a quasi-military solution was adopted, with the construction by the firm of large barracks where these young men were supposed to live under the employer's watchful eye. This was motivated not only by the desire to control the workers but also to avoid undesirable behavior that young single men seemed prone to adopt, such as excessive drinking, untrustworthiness, etc. However this initial solution did not function as planned and was soon abandoned. The Schneiders had to invent another method of social control, one that was more ambitious as it encompassed all aspects of the workers' lives. Under this system, family was the key variable of control. Instead of dealing with workers, Schneider realized they had to develop the model of the urban working family.

We observe the emergence of the urban household of Le Creusot, breaking its rural ties; abandoning the rural way of living; dwelling in small houses with private gardens; having its children attend schools organized by the company; and so on, with the many other tools created by the firm to both organize and control all aspect of the lives of the workers and their families. A largely shared view considers that the paternalistic model of the family was merely the reconstruction of a traditional rural family model (even though such a model is probably more imagined than real). This view is misleading because it is twisted toward the past. However conservative and backward-looking it may be, the paternalistic model of the family must be understood as completely new and innovative. A household in Le Creusot had very little in common with family organization in the rural areas from where the migrants came. In a way, the company managers, the Schneiders or Cheyssons, assumed the role of the feudal lord, as both protectors and oppressors of their subjects/workers. As we saw, this was not a mythical reference but a truly implemented

utopia. And it did have a cost for the firm as it had to invest to build – literally – the world in which its workers would live. But despite its cost, this system was efficient enough to meet the needs of a very rapidly growing city. It was capable of absorbing a large number of migrants coming from, first, the nearby countryside and, second, more distant areas. Finally, this system transformed this volatile rural population into a stable workforce of urban Creusotins.

This does not mean that the paternalistic model implemented by the Schneiders worked smoothly. From the workers' point of view, this model imposed heavy constraints. As a result, it also met with resistance and experienced failures. Family formation confronted two structural forces: the sheer numbers of migrants and the employment policy of the company that dominated the labor market. The urban labor market is clearly a constraint for migrants (Lee, 1999). And this was exacerbated in this particular setting where one company dominated the market. The selection of who is entitled to stay and who has to leave the city was an important feature of the paternalistic model. As we demonstrated, housing was the other important element in organizing family structure in the city. Dominating both labor and housing markets, the Schneider company was able to promote its family model by allowing only some kinds of migrants to settle in the city. Maybe it also influenced the behavior of those who settled, but we lack precise evidence to demonstrate this. There is no denying, however, that the company had a direct influence on many aspects of the workers' lives.

In a way, the company faced a dilemma – inherent to the development of an industrial city – between the need for a permanent supply of young and malleable workers, and that of a more stable and qualified labor force. To solve it, the firm needed a means to select – and promote – those who were willing to accept its conditions. Family structure, constrained through housing and labor, became such a means. This situation led to a major crisis in 1870–71 and to the expulsion of numerous recent and young workers. Afterwards the labor force composition shifted towards more qualified workers, especially those strongly established with their family, at the expense of unqualified, young, single, male workers. But the family model that resulted from this process was not the extended family model of the Leplaysian dream; quite the contrary, as the extended family appears to be incompatible with the development of paid labor with permanent job positions and old-age pensions.

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Notes

1. Information on place of birth is only available in the 1872 and 1876 censuses and, unfortunately, only at the *département* level. Nationality is recorded more often but the share of foreigners is insignificant before 1870 and still very limited after that date.
2. On the Whipple index see (Mokyr, 1983; Spoorenberg, 2007; A'Hearn, Baten, et al., 2009).
3. And this bias probably also varies with time; in the very first censuses there is no room on the form to enter the occupation of those who are not head of household.

4. Unfortunately marital status is not given in censuses starting from 1881 so we cannot perform this analysis for the last two dates considered in this paper.
5. We cannot rule out that those recently arrived in the city have a higher mortality rate than individuals of similar age and social condition, for instance as a result of working or housing hardships. This would not be sufficient, however, to explain the high number of people not reappearing from one census to the next.

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